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## Test 655: Oliver OC-4 Diesel

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The Experiment Station  
University of Nebraska College of Agriculture  
W. V. Lambert, Director, Lincoln, Nebraska

Department of Agricultural Engineering  
Dates of test: June 5 to 16, 1958  
Manufacturer: THE OLIVER CORPORATION,  
CLEVELAND, OHIO  
Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 655

OLIVER OC-4 DIESEL

BELT HORSEPOWER TESTS

| Hp   | Crank<br>shaft<br>speed<br>rpm | Fuel Consumption |                  |                 | Temp. Deg. F.     |                    |                    | Barometer<br>inches of<br>mercury |
|--|--------------------------------|------------------|------------------|-----------------|-------------------|--------------------|--------------------|-----------------------------------|
|  |                                | Gal<br>per hr    | Hp-hr<br>per gal | Lb per<br>hp-hr | Cooling<br>medium | Air<br>wet<br>bulb | Air<br>dry<br>bulb |                                   |
| * TESTS B & C—100% MAXIMUM POWER—TWO HOURS                         |                                |                  |                  |                 |                   |                    |                    |                                   |
| 26.08  | 1700                           | 2.252            | 11.58            | 0.604           | 164               | 58                 | 70                 | 28.845                            |
| TEST D—RATED POWER—ONE HOUR  |                                |                  |                  |                 |                   |                    |                    |                                   |
| 23.26  | 1818                           | 1.835            | 12.68            | 0.552           | 157               | 58                 | 71                 | 28.888                            |
| TEST E—VARYING POWER—TWO HOURS (20 minute runs; last line average) |                                |                  |                  |                 |                   |                    |                    |                                   |
| 23.24  | 1817                           | 1.835            | 12.66            | 0.552           | 156               | 58                 | 71                 | .....                             |
| 1.02   | 1951                           | 0.643            | 1.59             | 4.412           | 143               | 59                 | 71                 | .....                             |
| 12.20  | 1898                           | 1.192            | 10.23            | 0.684           | 152               | 58                 | 70                 | .....                             |
| 26.33  | 1703                           | 2.255            | 11.68            | 0.599           | 163               | 58                 | 70                 | .....                             |
| 6.18   | 1926                           | 0.853            | 7.25             | 0.966           | 146               | 58                 | 70                 | .....                             |
| 17.91  | 1863                           | 1.526            | 11.74            | 0.596           | 156               | 57                 | 68                 | .....                             |
| 14.48  | 1859                           | 1.384            | 10.46            | 0.669           | 153               | 58                 | 70                 | 28.908                            |

DRAWBAR HORSEPOWER TESTS

| Hp                                    | Draw<br>bar<br>pull<br>lbs | Speed<br>miles<br>per<br>hr | Crank<br>shaft<br>speed<br>rpm | Slip<br>of<br>drive<br>wheels<br>% | Fuel Consumption         |                     |                    | Temp. Deg. F.       |                    |                    | Barometer<br>inches of<br>mercury |
|---------------------------------------|----------------------------|-----------------------------|--------------------------------|------------------------------------|--------------------------|---------------------|--------------------|---------------------|--------------------|--------------------|-----------------------------------|
|                                       |                            |                             |                                |                                    | Gal<br>per<br>hr         | Hp-hr<br>per<br>gal | Lb<br>per<br>hp-hr | Cool-<br>ing<br>med | Air<br>wet<br>bulb | Air<br>dry<br>bulb |                                   |
| TEST H—RATED POWER—TEN HOURS—2nd Gear |                            |                             |                                |                                    |                          |                     |                    |                     |                    |                    |                                   |
| 18.55                                 | 2776                       | 2.51                        | 1831                           | 2.57                               | 1.749                    | 10.61               | 0.660              | 156                 | 61                 | 68                 | 28.819                            |
| TESTS F & G—100% MAXIMUM POWER        |                            |                             |                                |                                    |                          |                     |                    |                     |                    |                    |                                   |
| 19.30                                 | 5124                       | 1.41                        | 1697                           | 9.99                               | 1st Gear (part throttle) |                     |                    | 162                 | 74                 | 80                 | 28.525                            |
| 24.15                                 | 3951                       | 2.29                        | 1705                           | 4.25                               | 2nd Gear . . . . .       |                     |                    | 158                 | 49                 | 54                 | 29.030                            |
| 23.20                                 | 2614                       | 3.33                        | 1706                           | 2.06                               | 3rd Gear . . . . .       |                     |                    | 158                 | 49                 | 54                 | 29.030                            |
| 20.78                                 | 1489                       | 5.23                        | 1699                           | 1.31                               | 4th Gear . . . . .       |                     |                    | 158                 | 49                 | 54                 | 29.030                            |
| TEST K—SPEED-PULL CHARACTERISTIC      |                            |                             |                                |                                    |                          |                     |                    |                     |                    |                    |                                   |
| Pounds Pull                           |                            | 2776                        | 3951                           | 4000                               | 4000                     | 4050                | 4000               |                     |                    |                    | 3850                              |
| Horsepower                            |                            | 18.55                       | 24.15                          | 21.3                               | 19.2                     | 17.3                | 13.9               |                     |                    |                    | 11.3                              |
| Miles Per Hour                        |                            | 2.51                        | 2.29                           | 2.0                                | 1.8                      | 1.6                 | 1.3                |                     |                    |                    | 1.1                               |

FUEL, OIL, WATER and TIME Fuel Diesel Ce-tane No. ASTM 52 (rating taken from oil company's typical inspection data) Weight per gallon 6.998 lb Oil SAE 20 To motor 1.218 gal Drained from motor 0.910 gal Water used 0.215 gal Total time motor was operated 39 hours.

CHASSIS Type Tracklayer Serial No. 1WD-446 Tread width 46" Wheel base 56 1/8" Measured length of track 15.67 feet Cleats integral with shoes Cleats per track 32 Size of cleats 1 1/4" x 12" Advertised speeds mph first 1.562 second 2.373 third 3.365 fourth 5.273 reverse 1.814 Belt pulley diam. 8 1/2" face 6 1/2" rpm 1096 Belt speed 2440 fpm Belt flat Length 71" Width 6" Thickness 0.215" Maximum slip 0.54% Clutch double plate dry disc operated by foot pedal Seat upholstered Brakes contracting bands operated by two hand levers that can be locked by latches Equalized by hand action Power take-off standard type Steering hand levers controlling brakes.

ENGINE Make Hercules Diesel Type 3 cylinder vertical Serial No. 3600202 Crankshaft mounted lengthwise Head 1 Lubrication pressure Bore and stroke 3 1/2" x 4 1/2" Rated rpm 1700 Compression ratio 15 to 1 Displacement 130 cu. in Valves port diameter Inlet 1.44" Exhaust 1.25" Governor variable speed centrifugal Starting system 12 volt (two-6 volt batteries) Air cleaner oil washed wire mesh Muffler not used Oil filter one replaceable paper cartridge Fuel filter one replaceable waste type element and one replaceable paper element Cooling medium temperature control thermostat.

TOTAL WEIGHT AS TESTED (with operator) 5345 lbs.

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with fuel pump set to develop approximately 27 corrected maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H, and K were made with the same setting.

HORSEPOWER SUMMARY

|   | Drawbar | Belt  |
|---|---------|-------|
| 1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg)   | 24.75   | 27.31 |
| 2. Observed maximum horsepower (tests F and B)  | 24.15   | 26.08 |
| 3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings) | 18.56   | 23.21 |

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 655.

L. F. LARSEN  
Engineer-in-Charge

L. W. HURLBUT, Chairman  
G. W. STEINBRUEGGE  
J. J. SULEK  
Board of Tractor  
Test Engineers

## EXPLANATION OF TEST REPORT

**TEST A:** The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissible include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

### BELT HORSEPOWER TESTS

**TEST B:** The manual throttle control lever is set so that the throttle valve is held wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

**TEST C:** For tractors with carburetors the best fuel economy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors which have an altogether different fuel system.

**TEST D:** The manual throttle control lever is set the same as for tests B and C allowing the governor to control engine speed at part throttle. Load is applied until 85% of maximum corrected horsepower found in test B is obtained.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

**TEST E:** Varying load serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads, of 20 minutes each; rated load, no load,  $\frac{1}{2}$  rated load, maximum load at wide open throttle valve,  $\frac{1}{4}$  and  $\frac{3}{4}$  rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

### DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instrument in the test car. When rubber tires are used, all tests are made on the concrete test course. The same tires, wheels and weights are used for all tests except J. All crawler type tractors are tested on an earthen test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same for each test.

**TEST F:** A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in the test. The drawbar load is adjusted to give rated engine speed.

**TEST G:** Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The manual throttle control lever is set so that the throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 15%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

**TEST H:** Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated horsepower the manual throttle control lever is set the same as in tests F and G allowing the governor to maintain engine speed at part throttle. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

**TEST J:** The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

**TEST K:** This is intended to show the pull, horsepower, and travel speed of the tractor at rated horsepower (taken from test H); maximum horsepower (taken from test G); and at least four other conditions obtained by reducing travel speed in 10% increments by overload.

